UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

TRUSTEES OF BOSTON UNIVERSITY, Plaintiff, v. EVERLIGHT ELECTRONICS CO., LTD., et al., Defendants.	Consolidated Civil Action No. 12-11935-PBS
TRUSTEES OF BOSTON UNIVERSITY, Plaintiff, v. EPISTAR CORPORATION, et al., Defendants.	Civil Action No. 12-12326-PBS
TRUSTEES OF BOSTON UNIVERSITY, Plaintiff, v. LITE-ON INC., et al., Defendants.	Civil Action No. 12-12330-PBS

MEMORANDUM AND ORDER

July 22, 2016

Saris, C.J.

INTRODUCTION

Plaintiff Trustees of Boston University (BU) filed suit against Defendants Epistar Corporation, Everlight Electronics Co., Ltd., and Lite-On, Inc., alleging infringement of U.S. Patent No. 5,686,738. In November 2015, a jury found that the

patent was valid and willfully infringed, and awarded BU damages in the amount of $13,665,000. The defendants have now renewed their motion for judgment as a matter of law pursuant to Federal Rule of Civil Procedure 50(b),[1] and moved for a new trial, or remittitur, under Rule 59 (Docket No. 1728). The plaintiff has moved for enhanced damages under 35 U.S.C. § 284 (Docket No. 1632), and for attorneys' fees under 35 U.S.C. § 285 (Docket No. 1732), which the Court resolves in separate orders.

In the renewed motion for judgment as a matter of law, the defendants allege that the '738 patent does not teach one of ordinary skill in the art how to enable the full scope of the claimed invention. The defendants also argue for a new trial, or remittitur, on the damages award because it is not supported by comparable lump-sum licenses or comparable running royalty licenses that could have been adjusted to calculate a lump sum. Finally, the defendants argue for a new trial on the grounds that BU made prejudicial and inflammatory remarks regarding the defendants' nationality throughout trial.[2] After hearing, I uphold the jury's verdict as to validity and **DENY** the

[1] The defendants had already so moved under Federal Rule of Civil Procedure 50(a) at the close of the plaintiff's case, and again at the close of evidence. The Court denied both motions.

[2] The defendants raise a number of other arguments in their renewed motion for judgment as a matter of law, or alternatively a new trial, which the Court has previously addressed in other orders in this case. The Court assumes familiarity with those orders, and does not repeat its discussion of those issues here.

defendants' Rule 50(b) motion. The Court **ALLOWS** the motion for a new trial on damages, or remittitur, with respect to Epistar and Everlight, and **DENIES** the motion with respect to Lite-On. I **DENY** the renewed motion for judgment as a matter of law, or alternatively a new trial, on all other issues.

DISCUSSION

I. Standards of Review

Federal Circuit law governs patent law issues, while regional circuit law applies to procedural issues. Shockley v. Arcan, Inc., 248 F.3d 1349, 1358 (Fed. Cir. 2001). "The grant or denial of a motion for judgment as a matter of law is a procedural issue not unique to patent law, reviewed under the law of the regional circuit in which the appeal from the district court would usually lie." Summit Tech., Inc. v. Nidek Co., 363 F.3d 1219, 1223 (Fed. Cir. 2004). Likewise, the grant or denial of a motion for a new trial, and a district court's duty to remit excessive damages, are procedural issues, governed by the law of the regional circuit. See Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1309 (Fed. Cir. 2009); Shockley, 248 F.3d at 1358.

To prevail on a renewed motion for judgment as a matter of law following a jury trial, the moving party must show that "the evidence points so strongly and overwhelmingly in favor of the moving party that no reasonable jury could have returned a

verdict adverse to that party." Marcano Rivera v. Turabo Med. Ctr. P'ship, 415 F.3d 162, 167 (1st Cir. 2005). The Court must view the evidence in the light most favorable to the non-moving party, and may not substitute its own view for that of the jury where evidence is in conflict. See Osorio v. One World Techs., Inc., 659 F.3d 81, 84 (1st Cir. 2011).

In contrast, the Court's "power to grant a motion for a new trial is much broader than its power to grant a JMOL." Jennings v. Jones, 587 F.3d 430, 436 (1st Cir. 2009). With respect to the damages award, the Court has discretion "to order a remittitur if such an action is warranted in light of the evidence adduced at trial." Trainor v. HEI Hosp., LLC, 699 F.3d 19, 29 (1st Cir. 2012). "In reviewing an award of damages, the district court is obliged to review the evidence in the light most favorable to the prevailing party and to grant remittitur or a new trial on damages only when the award exceeds any rational appraisal or estimate of the damages that could be based upon the evidence before it." Wortley v. Camplin, 333 F.3d 284, 297 (1st Cir. 2003) (internal quotation marks omitted); Lucent, 580 F.3d at 1310 ("A jury's decision with respect to an award of damages must be upheld unless the amount is grossly excessive or monstrous, clearly not supported by the evidence, or based only on speculation or guesswork."(internal quotation marks omitted)).

II. Enablement

A. Legal Standard

Pursuant to 35 U.S.C. § 112, ¶ 1, a patent must be enabled in order to be valid. The "enablement requirement is satisfied when one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation." AK Steel Corp. v. Sollac & Ugine, 344 F.3d 1234, 1244 (Fed. Cir. 2003). The full scope of the claim must be enabled, meaning that the "scope of the claims must be less than or equal to the scope of the enablement" in order to ensure "that the public knowledge is enriched by the patent specification to a degree at least commensurate with the scope of the claims." Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc., 166 F.3d 1190, 1196 (Fed. Cir. 1999). Enablement is a question of law based on underlying facts. See In re Wands, 858 F.2d 735, 735 (Fed. Cir. 1988). It was the defendants' burden at trial to show by clear and convincing evidence that the patent was invalid for lack of enablement. See Microsoft Corp. v. i4i Ltd. P'ship, 564 U.S. 91, 95 (2011).

The '738 patent at issue in this case, titled "Highly Insulating Monocrystalline Gallium Nitride Thin Films," claims "a semiconductor device comprising . . . a non-single crystalline buffer layer . . . [and] a growth layer grown on the buffer layer." These semiconductor devices are used in light-

emitting diode (LED) packages. In its Markman order, this Court construed the term "non-single crystalline" to mean "polycrystalline, amorphous, or a mixture of polycrystalline and amorphous." Trs. of Boston Univ. v. Everlight Elecs. Co., Ltd., 23 F. Supp. 3d 50, 62-63 (D. Mass. 2014). The Court adopted the definition of "non-single crystalline" proposed by the inventor, Dr. Moustakas, at claim construction. See id. The Court also construed the term "grown on" to mean "formed indirectly or directly above." Id. at 59-62.

B. Analysis

Only enablement of the amorphous buffer layer was seriously in dispute at trial. In the first instance, the parties disputed whether the plaintiff was obliged to show enablement of the amorphous buffer layer, given the disjunctive nature of the claim construction definition. In BU's view, the specification need only enable at least one of the three possible iterations of the term "non-single crystalline," and the defendants could defeat the patent for invalidity only by showing that all three iterations of the buffer layer—polycrystalline, mixed, and amorphous—were not enabled. However, the defendants countered that they need only show that one iteration was not sufficiently enabled to demonstrate that the patent is invalid. The defendants' position ultimately won the day.

Although BU was entitled to request a changed claim construction up until the jury verdict, see Utah Med. Prods., Inc. v. Graphic Controls Corp., 350 F.3d 1376, 1381-82 (Fed. Cir. 2003), it pressed the tripartite definition throughout trial. Furthermore, BU pressed its position that it would deem an amorphous buffer layer infringing of the '738 patent. Having taken this stance, BU cannot also contend that it is not obliged to enable an amorphous buffer layer itself. This represents the fundamental "quid pro quo" of the patent endeavor. See AK Steel, 344 F.3d at 1244.

That said, the defendants raised a second, late-formed argument at trial that the patent must enable not only all three iterations of the buffer layer's crystallinity—polycrystalline, mixed, and amorphous—but also semiconductor devices with a gallium nitride (GaN) growth layer formed both directly and indirectly above all three iterations of the buffer layer. Neither the parties nor the Court could find any cases requiring enablement of every possible permutation of every iteration. The defendants cite to AK Steel, 344 F.3d at 1244, however, to support their argument.

In AK Steel, the patent at issue "read on steel strips containing either a Type 1 or a Type 2 aluminum coating," and "the claims require[d] that the coating wet well." Id. The Federal Circuit explained that the specification does not

necessarily have to "describe how to make and use every possible variant of the claimed invention, for the artisan's knowledge of the prior art and routine experimentation can often fill gaps, interpolate between embodiments, and perhaps even extrapolate beyond the disclosed embodiments, depending upon the predictability of the art." Id. Instead, "when a range is claimed, there must be reasonable enablement of the scope of the range." Id. The court concluded that the claims had not been enabled because the specification "clearly and strongly warn[ed]" that the Type 1 aluminum coating would not wet well, and the patent expressly taught against it. Id.

Here, the specification does not warn against any permutation. Claim 19 of the patent uses the term "grown on" to refer to both the relationship between the substrate and the buffer layer, and the relationship between the buffer layer and the growth layer. The Markman order specifically addressed "whether the term 'grown on' precludes the addition of layers between the layers expressly recited in the patent." Trs. of Boston Univ., 23 F. Supp. 3d at 59 (emphasis in original). The Court concluded that the term does not preclude additional layers, and construed "grown on" to mean "formed indirectly or directly above." Id. at 62 (emphasis added). Taken to its logical conclusion, the defendants' argument would require the patent to enable multiple permutations, representing various

combinations of a direct and indirect relationship between the substrate and the buffer layer, and the buffer and growth layer, for all three iterations of the buffer layer's crystallinity. I find that such a requirement would be unreasonable. BU was not obliged to show that the patent enabled a device with a GaN growth layer formed directly on an amorphous buffer layer, as long as it could demonstrate that the patent enabled a device with a GaN growth layer formed indirectly on an amorphous buffer layer.

Given this, the defendants' primary contentions are now that (1) the specification fails to teach one of ordinary skill in the art how to produce a semiconductor device with an amorphous GaN buffer layer without undue experimentation, and (2) even if an amorphous buffer layer was possible, the specification does not teach how to epitaxially grow a monocrystalline GaN layer on an amorphous GaN buffer layer. The jury heard testimony about enablement from one of the defendants' experts, Dr. Eugene Fitzgerald, an MIT professor of material science and engineering, as well as from the plaintiff's experts, Dr. Theodore Moustakas, the inventor, and Dr. Edwin Piner, a professor of material science engineering and commercialization at Texas State University. Both parties presented strong arguments in support of their respective positions. Based on the conflicting expert opinions, a

reasonable jury could have concluded that the defendants failed to show by clear and convincing evidence that the patent was invalid for lack of enablement.

As to the first theory of invalidity, Dr. Fitzgerald testified that "the patent does not teach how to make a device with an amorphous buffer layer," because "in the second step [of] . . . a two-step process, you crystallize the amorphous film, so there is no amorphous film." Trial Tr. vol. 6, Docket No. 1596, at 216, 223-24. Rather than teach how to grow an amorphous buffer layer, Dr. Fitzgerald opined, the patent "actually teaches you to crystallize the buffer," "[a]s the temperature increases to 600 degrees." Id. at 223.

However, the jury also heard testimony from Dr. Piner that one with ordinary skill in the art could "maintain[] the amorphous nature of the buffer layer, or even some sublayers" at the higher temperatures, based on "an understanding of what these temperature ranges mean." Trial Tr. vol. 4, Docket No. 1594, at 50. According to Dr. Piner, the patent "talks about forming an amorphous film to begin with," and that amorphous film "then can be, meaning can or cannot be as well, crystallized." Id. at 49. Dr. Piner further explained that "when the crystallization process happens, it doesn't necessarily have to occur throughout the entirety of the thickness of the buffer layer." Id. at 50.

Similarly, Dr. Moustakas testified that when he grew a "gallium nitride buffer, that material was amorphous. It didn't have any crystalline structure." Trial Tr. vol. 2, Docket No. 1592, at 76. Even though the GaN growth layer is monocrystalline, he clarified, "it will cover underneath material which is still either amorphous or polycrystalline." Id. at 88-89. The jury thus heard competing testimony from multiple qualified experts as to whether the patent enabled an amorphous buffer layer.

As to the defendants' second theory of invalidity, Dr. Fitzgerald testified that even if an amorphous buffer layer was enabled, the patent "does not teach how to make a device with a monocrystalline growth layer on an amorphous buffer layer." Trial Tr. vol. 6, Docket No. 1596, at 216. Furthermore, in Dr. Fitzgerald's opinion, "the patent is about epitaxy," and it is impossible to epitaxially grow a monocrystalline film on any amorphous substance without undue experimentation, whether or not that substance is GaN. See id. at 226-27, 232.

Once again, though, the jury heard conflicting testimony from the plaintiff's experts about what the patent teaches, whether it is possible to grow a monocrystalline film on an amorphous substance, and whether the patent requires an epitaxial process. First, Dr. Piner testified that a person of ordinary skill in the art could, using the teaching of the

patent, make an amorphous buffer layer with a monocrystalline GaN layer on top: "if you were to follow those sorts of boundaries within the teachings of the '738 patent," Dr. Piner stated, "you could realize with not much experimentation . . . the amorphous buffer layer . . . and then a monocrystalline gallium nitride on top." Trial Tr. vol. 4, Docket No. 1594, at 50. He testified that "the elements of the claim itself teaches how to do that accurately." Id. at 46.

Furthermore, both Dr. Moustakas and Dr. Piner challenged Dr. Fitzgerald's view about the impossibility of growing a monocrystalline layer on an amorphous substance. Dr. Moustakas testified that he has grown a single-crystalline semiconductor on an amorphous material, Trial Tr. vol. 2, Docket No. 1592, at 118, and that other scientists recently "reported single crystalline gallium nitride on glass," which "is an amorphous material," in the scientific journal Nature. Id. at 119.[3] Likewise, Dr. Piner stated, "I published a gallium nitride monocrystalline film that has grown on an amorphous material." Trial Tr. vol. 4, Docket No. 1594, at 46.

Although Dr. Piner agreed with Dr. Fitzgerald's view that one cannot epitaxially grow a monocrystalline layer on an

[3] Although this research occurred after the patent was issued, it was admitted solely to rebut the argument that such growth was scientifically impossible.

amorphous structure, he cautioned that "what the patent teaches is not epitaxy." Trial Tr. vol. 9, Docket No. 1599, at 143. Epitaxy is a process used to make semiconductors, involving the "controlled and oriented growth of a thin single-crystal layer upon the surface of another single crystal, with the deposited layer having the same crystalline orientation as its substrate." Trs. of Boston Univ., 23 F. Supp. 3d at 55 (quoting Wiley Electrical and Electronics Engineering Dictionary 260–61 (Steven M. Kaplan ed., 2004)). Dr. Piner agreed with this technical definition at trial, explaining that "in order to have epitaxy, you have one crystal structure, and on top of that you have another crystal structure, one single crystal, on top of that, another single crystal." Trial Tr. vol. 9, Docket No. 1599, at 143. He pointed out, however, that "the patent teaches the deposition of a film that is amorphous." Id.; see also U.S. Patent No. 5,686,738 col. 2 l. 40-41 ("A film . . . is deposited, which is amorphous at the low temperatures of the nucleation step."). By definition, amorphous means "having a noncrystalline structure." William D. Callister, Jr. & David G. Rethwisch, Materials Science and Engineering: An Introduction G1 (2010). Thus, Dr. Piner concluded that, "strictly speaking," the patent does not teach epitaxy. Trial Tr. vol. 4, Docket No. 1594, at 138.

Dr. Piner clarified that, although Dr. Moustakas "was using a growth process that happens to have in the term 'molecular beam epitaxy,'" it would be "misleading" to say that the patent uses an epitaxial process to form each layer. Trial Tr. vol. 4, Docket No. 1594, at 138. "You're still forming the material, you're still growing it," Dr. Piner explained, but "if you do not have an epitaxial relationship" between two materials, "[y]ou would say I'm growing a layer." Id. "Now, once you get to the GaN growth layer on top, you could perhaps use the term 'epitaxy' to describe the relationship of the crystal structure of the monocrystalline of the gallium nitride to that of the sapphire [substrate]." Id. Dr. Fitzgerald acknowledged that the word "epitaxy" does not appear anywhere in Claim 19 of the '738 patent. Trial Tr. vol. 7, Docket No. 1597, at 24. Thus, a reasonable jury could have concluded that it is possible to grow a monocrystalline GaN growth layer on an amorphous buffer layer, even if not epitaxially, and that the patent teaches one skilled in the art how to do so.

While the defendants presented credible evidence from Dr. Fitzgerald that the '738 patent did not enable an amorphous buffer layer, or teach how to grow a monocrystalline GaN layer on such an amorphous buffer, the plaintiff presented contrary evidence from Dr. Moustakas and Dr. Piner. Their testimony plainly supports that the patent teaches how to form a

monocrystalline GaN growth layer indirectly above an amorphous buffer layer, perhaps with an intervening polycrystalline layer. It is less clear whether the patent teaches how to grow a monocrystalline GaN layer directly on an amorphous buffer layer, with no intervening layers. Even if BU were required to show enablement of every possible permutation of every iteration, it was a close call at trial whether the patent enables a monocrystalline GaN growth layer formed directly on an amorphous buffer. The jury was ultimately tasked with weighing the conflicting views of qualified experts. Given the defendants' high burden in proving invalidity, a reasonable jury could have concluded that the defendants failed to show that the patent was not enabled by clear and convincing evidence. Accordingly, I **DENY** the motion for judgment as a matter of law.

III. Lump-Sum Damages Awards

A. Legal Standard for a Reasonable Royalty

Upon a finding for the claimant in a patent infringement case, "the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court." 35 U.S.C. § 284. "The burden of proving damages falls on the patentee." Lucent, 580 F.3d at 1324. "To properly carry this burden, the patentee must sufficiently tie the expert testimony

on damages to the facts of the case." Uniloc, USA, Inc. v. Microsoft Corp., 632 F.3d 1292, 1315 (Fed. Cir. 2011) (internal quotation marks and citations omitted).

There are several approaches for calculating a reasonable royalty. Lucent, 580 F.3d at 1324. Here, the parties agreed on the hypothetical negotiation approach, which "attempts to ascertain the royalty upon which the parties would have agreed had they successfully negotiated an agreement just before infringement began." Virnetx, Inc. v. Cisco Sys., Inc., 767 F.3d 1308, 1326 (Fed. Cir. 2014). "The hypothetical negotiation tries, as best as possible, to recreate the ex ante licensing negotiation scenario and to describe the resulting agreement." Lucent, 580 F.3d at 1325. "In other words, if infringement had not occurred, willing parties would have executed a license agreement specifying a certain royalty payment scheme. The hypothetical negotiation also assumes that the asserted patent claims are valid and infringed." Id. This analysis "necessarily involves an element of approximation and uncertainty." Id. The parties here agreed that the hypothetical negotiation would have occurred in 2000.

"A reasonable royalty may be a lump-sum payment not calculated on a per unit basis, but it may also be, and often is, a running payment that varies with the number of infringing units." Virnetx, 767 F.3d at 1326. Here, the jury awarded a one-

time, lump-sum payment for the life of the patent with respect to each defendant in the following amounts: $9,300,000 against Epistar, $4,000,000 against Everlight, and $365,000 against Lite-On. Verdict Form, Docket No. 1589, at 3. The jury, which was given the option on the verdict form of awarding a lump sum or a running royalty, left the space next to the running royalty option blank. Id.

B. Trial Testimony

At trial, BU's damages expert, Mr. Ratliff, testified that BU would have negotiated a hypothetical license with a running royalty of four to six percent on sales of the accused products. He ultimately applied a four-percent rate to each defendant's accused sales base to determine that the total damages against Epistar should be at least $8,660,914, the total damages against Everlight should be at least $5,686,693, and the total damages against Lite-On should be at least $538,700.[4] Mr. Ratliff structured his testimony around the Georgia-Pacific framework, which outlines fifteen factors for juries to consider in awarding a reasonable royalty. See Georgia-Pacific Corp. v. U.S. Plywood Corp., 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970). Subsumed

[4] Mr. Ratliff also presented an alternative, lower set of damages figures, calculated using a four-percent rate and a smaller revenue base, in case the jury accepted the defendants' arguments under the entire market value rule. The lower damages figures were: $7,814,260 against Epistar, $4,407,990 against Everlight, and $221,552 against Lite-On.

within the second factor "is the question of whether the licensor and licensee would have agreed to a lump-sum payment or instead to a running royalty based on ongoing sales or usage." Lucent, 580 F.3d at 1326.

Mr. Ratliff only testified in support of a running royalty, and did not explain how the jury could convert his figures into lump-sum payments should the jury choose to adopt a lump-sum format. He highlighted one of the critical differences between a running royalty and a lump-sum payment. He explained that when parties enter "a running royalty, a percentage of sales is an unknown. You don't know how much someone's actually going to use your patents and what you're going to sell. So on day one when you enter a running royalty license, you may never see any royalties." Trial Tr. vol. 5, Docket No. 1595, at 107-08. In contrast, in a lump-sum license, "you never know how much the licensee is going to use the technology, but they're paying you money up-front. It's a guaranteed return." Id. at 108. Despite the fact that the plaintiff's expert never testified in support of lump-sum awards, BU's counsel pivoted from his expert's testimony and argued for lump-sum awards in closing argument.[5]

[5] The issue of damages became complicated at trial because, at the last minute, Everlight claimed there was a mistake in the sales data it provided to the plaintiff in that it included non-GaN LEDs. Everlight argued that the data Mr. Ratliff used to generate the sales base included revenue from "red and yellow LED chips which [were] not accused and could not conceivably

In contrast, the defendants' damages expert, Dr. Mangum, testified that the parties would have negotiated a hypothetical license under which BU would have accepted the lesser of a $500,000 lump-sum payment, a $250,000 lump-sum payment plus a 0.5% running royalty on sales of accused products, or a 1% running royalty on sales of accused products, with respect to each defendant. Dr. Mangum derived this royalty structure from a 2002 license agreement for the '738 patent between BU and Cree Lighting Company (Cree). Mr. Ratliff also relied heavily on this agreement in his analysis, even though he only testified in support of a running royalty.

BU first licensed the '738 patent to Cree in March 2001. In exchange for an exclusive license to the '738 patent, Cree agreed to (1) an upfront fee of $250,000, (2) a 2% running royalty on net sales of Cree products that practice the '738 patent, (3) a minimum annual royalty payment of $25,000, and (4) certain sublicense royalty lump-sum payments. In June 2002, BU and Cree amended the license agreement. Under the amended agreement, Cree paid an additional $250,000 upfront fee, and the

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infringe the patent." Docket No. 1456, at 6-7. At trial, the parties presented conflicting evidence about whether a red or yellow LED could be made from a GaN LED chip, which typically produces blue or green light. Regardless, correcting this alleged error in the sales data could have reduced a running royalty damages award. Using a lump sum, made the math easy by comparison, and BU's counsel argued the jury should award a lump sum in part to avoid wading through the confusion on this issue.

parties lowered the running royalty rate to 1%, increased the minimum royalty obligation to $50,000 per year, and changed the sublicense royalty arrangement so that Cree now had three options for sharing any sublicense royalty with BU. Cree could (1) pay BU a $500,000 lump-sum royalty for a new sublicense, (2) pay BU a $250,000 lump-sum royalty plus a 0.5% running royalty on sublicensee sales, or (3) pay BU a 1% running royalty on sublicensee sales.

At trial, Dr. Mangum calculated a range of damages figures for each of the defendants based on how the jury decided different issues, such as whether certain sales constituted foreign sales or were licensed, and should therefore be excluded from the sales base for a running royalty payment. He explained that a royalty base, however, would only be relevant to the royalty analysis if the jury believed that a running royalty was the appropriate structure. Dr. Mangum further testified that a "lump-sum royalty is perfectly applicable in this case," because the licensing history of the '738 patent is mostly comprised of lump-sum agreements. Trial Tr. vol. 9, Docket No. 1599, at 67-68. Under his approach, the damages awards for each defendant were essentially capped at a $500,000 lump-sum payment.

C. Analysis

The defendants now argue that they are entitled to a new trial on damages, or remittitur, because the lump-sum damages

awards are not supported by the evidence under Lucent, 580 F.3d at 1323-36. In Lucent, the plaintiff "asked for a damages award based only on a running royalty" of approximately $562 million. Id. at 1323-25. The defendant, "on the other hand, told the jury that the damages should be a lump-sum royalty payment of $6.5 million." Id. at 1325. The jury ultimately awarded a one-time, lump-sum payment of $358 million, and the district court denied the defendant's motions for judgment as a matter of law and for a new trial, with respect to the damages award. Id. at 1309.

In deciding whether substantial evidence supported the jury's verdict of a $358 million lump-sum payment, the Federal Circuit emphasized that "certain fundamental differences exist between lump-sum agreements and running-royalty agreements." Id. at 1330. The Federal Circuit further clarified:

> This is not to say that a running-royalty license agreement cannot be relevant to a lump-sum damages award and vice versa. For a jury to use a running-royalty license agreement as a basis to award lump-sum damages, however, some basis for comparison must exist in the evidence presented to the jury.

Id. The Lucent court determined that "the jury had almost no testimony with which to recalculate in a meaningful way the value of any of the running royalty agreements to arrive at the lump-sum damages award." Id. Furthermore, the court found that the lump-sum license agreements in evidence did not support the damages award because they were not sufficiently comparable to

the hypothetical agreement for the patent at issue. Id. at 1328-30. Thus, the court concluded that "no reasonable jury could have found that Lucent carried its burden of proving the evidence, under the relevant Georgia-Pacific factors, supported a lump-sum damages award of $357,693,056.18." Id. at 1335.

According to the defendants in this case, BU repeated the same errors as the Lucent plaintiff, and the lump-sum awards are "not supported with comparable lump-sum licenses, or comparable running royalty licenses that could have been adjusted for purposes of calculating a lump-sum royalty." Docket No. 1728, Ex. 1, at 53. BU responds that "the jury had a great deal of evidence to both support its lump sum findings and to support converting the royalty rates that Alan Ratliff testified about into the lump sum form that the Defendants argued was the correct form of royalty." Docket No. 1739, at 53. More specifically, BU points to several license agreements as offering sufficient support for the lump-sum verdict.

First, BU points to a lump-sum license agreement between RPX and BU, in which RPX paid $13.5 million for a license to the '738 patent. Mr. Ratliff testified that this was the largest lump-sum payment that any entity ever made to BU for a license to the '738 patent. RPX and BU entered into this agreement in January 2014, when the patent only had ten months left on its term, and fourteen years after the agreed-upon date for the

hypothetical negotiation. Mr. Ratliff explained at trial that RPX "aggregates IP and then sells memberships to companies who can sort of buy into the IP that is aggregated . . . ." Trial Tr. vol. 5, Docket No. 1595, at 201. The RPX-BU license involved twenty-five companies, which obtained rights to the '738 patent through their RPX memberships. The defendants highlight that the payment attributable to each company receiving rights under the RPX license was $540,000.

Furthermore, BU's damages expert testified that he chose not to rely on the RPX license in his damages calculations because "it was so late in time, so long after the hypothetical," and because he lacked crucial information about the twenty-five companies that gained rights to the patent. Trial Tr. vol. 5, Docket No. 1595, at 234-36. For example, he did not know whether the companies were previously on notice of the patent or whether their LED chip suppliers already had a license to the patent. He also did not know the specific amounts these companies paid for their RPX memberships. Like BU's damages expert, without more information, the jury could only speculate about how the RPX agreement could be compared to any licensing agreement resulting from the hypothetical negotiation between BU and the defendants.

Next, BU points to the fact that "Cree used the patent to offset an infringement claim against it brought by Nichia

Corporation" in 2001. Docket No. 1739, at 53. To settle the litigation, Nichia and Cree entered a cross-licensing agreement, in which Cree gave Nichia a sublicense to the '738 patent. In return, Nichia gave Cree a license to some of its patents, but did not pay BU or Cree any money. BU argues that this cross-license was worth more than $10 million because the Nichia lawsuit was a "bet-the-company dispute," which "would have been very detrimental to [Cree's] ability to continue to operate successfully had they ended up having to pay large license fees to Nichia." Trial Tr. vol. 5, Docket No. 1595, at 107. BU highlights testimony from Mr. Ratliff that if Nichia and Cree had entered the standard sublicensing agreement provided for in the BU-Cree license—with a $250,000 lump-sum payment and 1% or 0.5% running royalty—instead of the cross-licensing agreement, Nichia would have ultimately paid "[t]ens of millions of dollars." Trial Tr. vol. 5, Docket No. 1595, at 38.

The defendants respond that this testimony is based on "utter speculation" on what Nichia would have paid Cree if it had taken a running royalty license, assumes that Nichia would have actually practiced the patent, and is contrary to what actually happened. Docket No. 1748, at 14. Under the original BU-Cree license agreement, the parties specified that if Cree settled with Nichia, Cree would pay BU a lump-sum payment of $350,000. BU and Cree amended their agreement in 2002, as

discussed above, "to provide Cree with greater flexibility in how it would sublicense to others," and to address the Nichia litigation. Trial Tr. vol. 5, Docket No. 1595, at 106-07. Under the amended agreement, they increased the amount Cree would pay BU upon reaching a settlement with Nichia to $1 million. Thus, when Cree settled with Nichia and entered the cross-license, Cree paid BU $1 million.

The Court agrees with the defendants that Mr. Ratliff's testimony about what Nichia would have paid under a running royalty agreement with Cree, if the parties had not entered a cross-license, does not support the jury's lump-sum awards. BU's argument ignores the differences between a running royalty and a lump-sum payment that BU's damages expert discussed at trial, and the Federal Circuit emphasized in Lucent, 580 F.3d at 1326. The jury had no basis on which to compare a hypothetical running royalty agreement between Cree and Nichia to a lump-sum award between BU and the defendants because BU's damages expert did not provide a framework for how the jury could have done so. Furthermore, BU did not put on any evidence of Nichia's sales of patented technology to support the $10 million running royalty estimate.

Third, BU argues that testimony related to a 2009 license agreement between Philips and Epistar for red LED patents supports the jury's lump-sum awards. The defendants correctly

point out that the Court excluded the Philips license agreement because the plaintiff's expert, Dr. Piner, could not recall whether the agreement involved GaN LEDs—and therefore was comparable to the '738 patent—when he testified at trial.[6] Despite the fact that the license agreement is not in evidence, BU cites to clips of a videotaped deposition played at trial of Epistar's corporate representative, Meng Kuo, who discussed the Philips license.

Meng Kuo testified that Epistar paid Philips between $10 million and $20 million for a license to three patents for red LED chips. The $10-to-$20-million estimate included an up-front fee of $6.4 million, and subsequent minimum payments that totaled $4.6 million. BU did not offer any evidence of the time period over which the $4.6 million was paid, or how these payments are comparable to a one-time, lump-sum payment. When asked whether the Philips license was the best evidence of Epistar's attitude toward licensing LED patents in 2009, Meng Kuo responded that the products in the Philips patents are "different." Trial Tr. vol. 9, Docket No. 1599, at 139.

[6] As discussed above, GaN LED chips typically produce blue or green light, as opposed to red, and there was conflicting evidence about whether a red LED could be made from a GaN chip. BU did not produce any evidence at trial about whether the Philips license agreement applied to GaN LEDs.

BU also cites to its cross-examination of the defendants' damages expert, when counsel for BU asked whether defense expert Dr. Mangum presented the $20-million estimate from the Philips license to the jury. Dr. Mangum simply answered that he did not.[7] Given that the license agreement itself is not in evidence, and that the agreement covered three patents for a different type of LED chip, this testimony is not enough to establish that the Philips license is comparable to the hypothetical negotiation in this case.

Finally, BU cites to the evidence it presented in support of a running royalty for each defendant as support for the lump-sum verdict. The lump-sum payments awarded by the jury are close to the amounts Mr. Ratliff testified to as appropriate running royalties. However, as discussed above, BU produced no evidence of how the jury could "recalculate in a meaningful way" the value of the running royalties to arrive at the lump-sum damages awards. Lucent, 580 F.3d at 1330. The lump-sum awards for Epistar and Everlight—of $9.3 million and $4 million

[7] BU similarly cites to its cross examination of the defendants' damages expert to argue that Epistar licensed a "limited number of patents" from Osram for 14 million Euros. Docket No. 1739, at 54. In the cross-examination, BU's counsel asked whether Dr. Mangum had told the jury about a 14 million Euro lump-sum royalty payment from Everlight, not Epistar, to Osram. Dr. Mangum replied that it was not in his slides. The defendants correctly point out that the Osram license was never introduced into evidence nor discussed by any other witness.

respectively—are well above the $1 million Cree paid BU when it entered a cross-license with Nichia involving a sublicense to the '738 patent, and the $500,000 figure that the defendants' damages expert argued would be the highest appropriate lump-sum for each defendant. Therefore, as in Lucent, the Epistar and Everlight damages awards are based on speculation and not supported by the evidence. The Court **ALLOWS** the defendants' motion for a new trial on damages, or remittitur, with respect to these two defendants.

In contrast, the lump-sum award against Lite-On of $365,000 is within the range of options that Dr. Mangum testified about at trial. Dr. Mangum stated that BU would have accepted the lesser of a $500,000 lump-sum payment, a $250,000 lump-sum payment plus a 0.5% running royalty on sales of accused products, or a 1% running royalty on sales of accused products. For Lite-On, he explained that a 1% running royalty on sales of accused products would have been the lesser of these options, and calculated this royalty to be $103,479. However, the jury could have reasonably disagreed with his analysis that BU would have accepted the lesser of these options, and instead concluded that the parties would have negotiated a lump-sum award closer to $500,000. I find that the damages award against Lite-On is supported by the evidence, and **DENY** the motion for a new trial on damages, or remittitur, with respect to Lite-On.

D. Remittitur

Both the First Circuit and the Federal Circuit follow the "maximum recovery rule," which permits the Court to grant a remittitur "geared to the maximum recovery for which there is evidentiary support (subject, of course, to the plaintiff's right to reject the remittitur and instead elect a new trial on the disputed damages claim)." Trainor, 699 F.3d at 33; see also Shockley, 248 F.3d at 1362 (noting that the Federal Circuit follows the "'maximum recovery rule,' which remits an excessive jury award to the highest amount the jury could 'properly have awarded based on the relevant evidence'" (quoting Unisplay, S.A. v. Am. Elec. Sign Co., 69 F.3d 512, 519 (Fed. Cir. 1995))). After a careful review of the record, the Court concludes that, in this case, based on the jury's choice of a lump-sum format, "the upper limit of the universe of reasonable outcomes," Trainor, 699 F.3d at 33, is a $1 million one-time, lump-sum payment against each defendant. The defendants concede that a $1 million lump-sum award against Epistar, and a $1 million lump-sum award against Everlight, are supported by the evidence, including the BU-Cree license and the $1 million payment from Cree to BU surrounding the Nichia settlement and cross-license. The Court, therefore, allows the plaintiff the option of a new trial on damages or the remitted damages award of a $1 million lump sum against Epistar and a $1 million lump-sum against

Everlight. If BU refuses to accept this reduction in the damages awards, it will be entitled to a new trial on damages.

IV. Remarks Regarding Defendants' Nationality

Defendants argue that BU's "prejudicial and inflammatory remarks regarding [the] defendants' nationality" throughout trial and in closing argument merit a new trial. Docket No. 1728, Ex. 1, at 50. More specifically, they contend that BU "repeatedly argued that the jury should award higher royalties against Defendants because they are Taiwanese companies that would not help American industry and would cost American jobs." Id. BU responds that "merely noting that Defendants are Taiwanese companies is not inflammatory." Docket No. 1739, at 67. Furthermore, BU argues that its higher royalty rate theory was not prejudicial because the Bayh-Dole Act, 35 U.S.C. § 204, requires BU to "give a preference to companies that make products in the United States," when licensing its patents. Docket No. 1739, at 67 (emphasis omitted).

"In assessing the effect of improper conduct by counsel, the Court must examine the totality of the circumstances, including the nature of the comments, their frequency, their possible relevancy to the real issues before the jury, the manner in which the parties and the court treated the comments, the strength of the case, and the verdict itself." Osorio, 659 F.3d at 90 (quoting P.R. Aqueduct & Sewer Auth. v. Constructora

Lluch, Inc., 169 F.3d 68, 82 (1st Cir. 1999)). However, when no timely objection is made, claims that counsel made improper arguments are forfeited, and thus subject to review for plain error. P.R. Aqueduct, 169 F.3d at 82; Smith v. Kmart Corp., 177 F.3d 19, 25-26 (1st Cir. 1999). Under plain error review, the Court "will consider a forfeited objection only if: (1) an error was committed; (2) the error was 'plain' (i.e. obvious and clear under current law); (3) the error was prejudicial (i.e. affected substantial rights); and (4) review is needed to prevent a miscarriage of justice." Smith, 177 F.3d at 26. The movant's burden under the plain error standard is considerable. Id. "Plain error is a 'rare species in civil litigation,' encompassing only those errors that reach the 'pinnacle of fault' envisioned by the standard set forth above." Id. (quoting Cambridge Plating Co., Inc. v. Napco, Inc., 85 F.3d 752, 767 (1st Cir. 1996)).

Here, the allegedly improper remarks include (1) questions BU's counsel asked a Cree employee, (2) testimony from the plaintiff's damages expert, and (3) statements BU's counsel made during closing arguments. The defendants only objected to the first set of statements. The defendants now argue that they did not object to BU counsel's comments during closing argument because the Court "specifically stated that the parties were not to object during closing argument." Docket No. 1728, Ex. 1, at

51. However, the defendants mischaracterize what the Court said. When instructing the jury that closing arguments are not evidence, before closing arguments began, I noted:

> Also, there is a certain etiquette, for the most part, people don't pop up and object every time they disagree with the other side's versions of the facts, or we'd never finish this. So, in general, you will not be hearing objections, but I can guarantee you that doesn't mean they agree with it, they probably disagree with most of it. That's the working order here.

Trial Tr. vol. 9, Docket No. 1599, at 162. The parties were free to object to anything opposing counsel said at sidebar after closing arguments, or to object to anything particularly egregious, during the arguments. The defendants chose not to do so. Thus, I review the first set of statements based on a totality of the circumstances and the other remarks for plain error.

First, BU's counsel asked Mr. Garceran, the chief intellectual property counsel at Cree, the following question: "In your view is it fair, is it reasonable to try to compare how BU treated a U.S.-based company, a company that had a long relationship with BU, and pretend like that's what would have happened if BU had been dealing with Epistar, a Taiwanese company?" Trial Tr. vol. 5, Docket No. 1595, at 43. The defendants objected to this question, and the Court overruled the objection. However, the witness became confused on the

stand, and asked BU's counsel to repeat the question. In doing so, BU's counsel rephrased the question as follows:

> In your experience in dealing with BU for ten years, in your experience in this industry for many years and in licensing for many years, is it reasonable in any way to assume that BU would have treated Epistar, Everlight and Lite-On in licensing the same way they would have treated a U.S. partner entity that they're trying to support U.S. industry?

Id. at 44. The defendants' counsel again objected, and this time, I sustained the objection.

Next, BU's damages expert, Mr. Ratliff, testified that, as part of the hypothetical negotiation analysis, the jury "may consider a higher royalty rate" than that contained in the BU-Cree license because the defendants "are all non-U.S. entities and don't have any part in building the domestic industry." Trial Tr. vol. 5, Docket No. 1595, at 127. Cree is an American company, located in North Carolina. These statements must be considered in light of testimony from Mr. Pratt, the managing director of BU's Office of Technology Development. Mr. Pratt noted that one factor BU considers when licensing its patents is whether the potential licensee is an American company. He explained that when BU grants an exclusive license to a patent for an invention created through the use of federal funds, BU has a "responsibility" under the Bayh-Dole Act to "give a preference to companies that make products in the United States." Trial Tr. vol. 6, Docket No. 1596, at 76-77; 35 U.S.C.

§ 204. He further testified that there are business reasons why it is more convenient for BU to license its patents to "local" companies that operate under the same laws, have similar business practices, speak the same language, and are located in the same time zone. Trial Tr. vol. 6, Docket No. 1596, at 76.

Finally, in closing argument, BU's counsel emphasized that the jury should award a higher royalty than that in the BU-Cree license because the defendants are "three Taiwanese companies, who literally were going to be taking away American jobs and American industry and competing directly with American industry," as compared to "Cree, who . . . [BU] supported precisely to build the American industry." Trial Tr. vol. 9, Docket No. 1599, at 245-46.

While BU's counsel went further than "merely noting that Defendants are Taiwanese companies," the comments in question do not warrant a new trial. In light of BU's stated preference to license its patents to local companies for business reasons, and the policies underlying the Bayh-Dole Act, all of the statements were relevant to the issue of whether BU would have sought a higher royalty from foreign defendants, as compared to Cree, in the hypothetical negotiation. It is not "obvious and clear under current law" that the statements were inflammatory and prejudicial. Smith, 177 F.3d at 26. Thus, the Court **DENIES** the motion for a new trial on the basis on these statements.

ORDER

For the foregoing reasons, the defendants' renewed motion for judgment as a matter of law pursuant to Federal Rule of Civil Procedure 50(b), and motion for a new trial, or remittitur, under Rule 59 (Docket No. 1728), is **DENIED** in part and **ALLOWED** in part. The Court **DENIES** the motion for judgment as a matter of law in its entirety, and **DENIES** the motion for a new trial on all issues, except damages. The Court **ALLOWS** the motion for a new trial on damages, or remittitur, with respect to Epistar and Everlight, and **DENIES** the motion with respect to Lite-On.

BU shall inform the Court within two weeks whether it accepts the remittitur or seeks a new trial on damages. It shall also submit a separate form of judgment as to each defendant. If BU requests a new trial on damages, the Court anticipates the defendants will appeal all other issues to the Federal Circuit, before a new trial on damages, under 28 U.S.C. § 1292(c)(2). Cf. Bosch v. Pylon Mfg. Corp., 719 F.3d 1305, 1313 (Fed. Cir. 2013).

/s/ PATTI B. SARIS
Patti B. Saris
Chief United States District Judge